REMARKS

This amendment is responsive to the non-final Office Action of March 29, 2005. Reconsideration and allowance of claims 1-11, 17-18, 20-22, and 24-28 are requested.

The Office Action

Claims 1, 12, 13, 17-19, and 22 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kinast (US 5,995,858) in view of Abraham (US 6,407,978).

Claims 1-7, 19, and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fuller (US 5,792,668) in view of Abraham.

Claim 8 stands rejected under 35 U.S.C. § 103 as being unpatentable over Fuller, in view of Abraham, further in view of Nappholz (US 5,113,869).

Claim 9 stands rejected under 35 U.S.C. § 103 as being unpatentable over Fuller, in view of Abraham, further in view of New (US 6,494,829).

Claims 10 and 21 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fuller, in view of Abraham, further in view of Papadakis (US 5,461,921).

Claims 14, 15, and 23 were previously cancelled.

Claims 24-28 are newly added.

The Present Application

The present application addresses the problem of measuring medical information in environments where noise from other medical devices, power lines, fluorescent lights, mobile telephones, and other electrical equipment can interfere with the measurement. While these various electrical devices have characteristic frequencies at which they operate or at which their internal oscillators oscillate, it is difficult to predict which equipment will be in a hospital room, surgical suite, or the like with a patient whose medical information is to be measured. Hence, it is difficult to predict at what frequencies a medical measurement device can operate without interference.

A solution to this problem is had by making the measurements at each of a plurality of randomly selected frequencies within a preselected spectrum. The

measurements made at frequencies on which there is no noise interference, normally most of the frequencies, should be consistent. Measurements at frequencies with significant noise can be readily determined based on the received noise or measurement inconsistencies.

None of the applied references address this problem nor achieve the current solution.

The References of Record

Kinast relates to a blood oximeter. As is conventional, the blood oximeter includes a red LED and an IR LED which are alternately pulsed. The red and IR LEDs produce light at two characteristic frequencies (i.e., with the red wavelength and the IR wavelength (abstract, lines 2-4). No means are provided to cause either LED to emit light at other than its characteristic wavelength or frequency. A common detector detects the two signals after passing through a portion of the body rich in blood. A microprocessor analyzes the results to determine the level of blood oxygen. A significant portion of the improvement on which Kinast focuses is the application of the driving pulses to the red and IR LEDs at the same periodicity, but differing in phase by 90°.

Fuller relates to radio frequency spectroscopy (column 1, lines 15-16). In spectroscopy, one irradiates a sample with either a spectrum of frequencies or specific frequencies within the spectrum and listens for the frequency response. The response is not the same as the input signal. Rather, molecules have inherent characteristic resonant frequencies. That is, the molecule may either absorb energy at various frequencies and use that energy to resonate at its resonance frequency emitting more energy at the reference frequency than was input, or may absorb energy primarily at resonance frequencies greatly attenuating the input frequency components at the resonant frequencies. Because the resonance frequencies are generally attributable to the chemical bonds, complex organic molecules with large numbers of bonds each have a relatively complex frequency fingerprint or signature.

Fuller inputs a comb spectrum in which a radio frequency signal at uniformly spaced frequency offsets is input with the same power at each frequency (column 5, lines 60-65). The number of frequencies input may be approximately 101

separate frequencies (column 16, lines 19-20). The number of frequencies is not surprising. The human body has numerous organic compounds, many of which have numerous chemical bonds, some similar and some dissimilar to each other. In order to differentiate among the numerous organic compounds that might be present, one would expect a large number of frequencies to be needed. Fuller's spectroscopy system receives a data sample back from the system in which the 101 equiamplitude input frequencies are, in the received signal, no longer equiamplitude. The microprocessor operates under a program such as neural network or look-up table in order to recognize the spectral signature of a target chemical (column 10, lines 15-23 and lines 29-32).

Because the spectroscopy system of Fuller is looking for a spectral signature, i.e., variations in the data at specific frequencies, Fuller cannot randomly throw frequency signals into the sample. The frequency signals of Fuller must be appropriately selected to hit the characteristic frequencies of a target chemical and to differentiate between a response from the target chemical and similar organic chemicals. Random frequencies selected without intelligence will not provide reliable data for the neural network look-up table, or algorithm of the microprocessor **74**.

Abraham is directed to power system communications and more particularly, to an apparatus capable of simultaneously transmitting and receiving digital data at high rates over long distances through power lines and power line transformers (column 1, lines 21-26). Abraham, at column 19, line 5, indicates that the present invention may be implemented using spread spectrum technology, but:

> spread spectrum modulation is not preferred due to a number of drawbacks presently associated with such technology. For instance, as opposed to other modulation techniques, the bandwidth it required is too large, it is sensitive to interference, and it is regulated by the government for emission testing above 1.7 MHz carrier frequency (column 19, lines 6-12).

Thus, Abraham specifically teaches against spread spectrum modulation. Moreover, one of the reasons why Abraham gives for spread spectrum modulation being unacceptable is its high sensitivity to interference, the very problem which the present application is looking to cure.

Nappholz is directed to an electrocardiographic monitor. Like other cardiographic monitors, it analyzes electrocardiographic signals. Nappholz is particularly interested in arrhythmias.

It is submitted that Nappholz merely shows that those of ordinary skill in the art understand how to receive and analyze electrocardiographic signals, but contains no suggestion regarding how to modify spectrographic devices to sense electrocardiographic signals. That is, Nappholz shows enablement, but does not show obviousness.

New discloses a physiological sensor array which shows that it is known in the art to measure respiration electrically. New makes no suggestion regarding modifying spectroscopy equipment. Indeed, there is no motivation in New concerning modifying spectroscopy devices.

Papadakis relates to the non-destructive testing of materials and more particularly to an ultrasonic flaw detection system. More specifically, Papadakis relates to testing bridges for critical flaws which might put the public in danger of catastrophic failure (column 1, lines 5-24). Papadakis does not relate to medical diagnostics and contains no allusion to spectroscopy, much less any teaching or motivation regarding the modification of spectroscopy devices.

The Claims Distinguish Patentably Over the References of Record

Claim 1 calls for selecting frequencies within a preselected spectrum such that randomized frequencies are selected. Kinast does not randomly select frequencies. Rather, Kinast actuates red and IR diodes with a fixed periodicity with a 90° phase offset. There is no suggestion of generating input signals at more than a single frequency, much less randomly selected frequencies. It is submitted that the red and IR LEDs of Kinast would each have a characteristic frequency or frequency spectrum and that no means are suggested for causing the LEDs to emit light at random frequencies. Abraham does not cure this shortcoming. Although Abraham references spread spectrum modulation, Abraham specifically teaches against its use due to its sensitivity to interference and other problems. Accordingly, Abraham does not render it obvious to modify Kinast to randomly alter the frequency of the input signals.

Moreover, it is submitted that the combination of Kinast and Abraham do not provide an enabling disclosure which would enable one of ordinary skill in the art to alter the frequency of the red and IR light emitted by the red and IR LEDs.

Fuller is directed to a spectroscopy device which outputs preselected frequencies at a common amplitude to find the characteristic signature of the analyzed sample. Because Fuller needs a large number of carefully selected frequencies, e.g., approximately 101, it is submitted that randomly sending out frequency signals would render Fuller inoperative for its intended purpose. Random frequency signals would not assure Fuller of the complete set of information needed to recognize an organic chemical's signature.

Additionally, Abraham relates to communication over power lines, not spectroscopy for in-vitro or in-vivo environments. Abraham provides no motivation or related teaching to those working in the in-vitro and in-vivo analysis fields for modifying spectrometry devices. Rather, Abraham relates to multiplexing communication signals. Abraham teaches nothing about how signals which are sent into a subject for analysis purposes should be prepared. It is submitted that if one were ordered to try to combine Abraham with Fuller, one would **not** be taught the presently claimed limitations, but rather would be taught that the output data should be sent multiplexed over power lines to a distant remote location using the Abraham technique. Such a combination does not render the present claims obvious or unpatentable. Accordingly, it is submitted that **claim 1 and claims 10-11 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 6 calls for directing electrical input signals which are randomly spread across a frequency spectrum to a medium. The Fuller spectroscopy technique relies on inputting a known and preselected spectrum of frequency signals. Randomly selecting signals, it is submitted, would render Fuller inoperative for its intended use. Abraham specifically teaches against spread spectrum modulation due to its sensitivity to interference. Accordingly, it is submitted that Abraham would not motivate one of ordinary skill in the art to modify Fuller such that sends random frequency signals into the test subject rather than the carefully selected set of signals. Accordingly, it submitted that **claim 6 and claims 2-5, 7-9, and 24** distinguish patentably and unobviously over the references of record.

Claim 17 is directed to a spread spectrum measurement device for measuring a desired physiological condition of a patient while avoiding degradation of the measured physiological condition due to interference. Although Kinast does measure a physiological condition, it does not use spread spectrum technology. Abraham uses against the use of spread spectrum technology due to its sensitivity to interference.

Further, claim 17 calls for a means for transmitting signals at different frequencies into a medium and for a detecting means to detect signals at the different frequencies from the medium. A randomized clock signal is conveyed to the transmitting and detecting means to control the transmitting and detecting means to transmit and detect signals at random frequencies across a selected spectrum. By contrast, the red LED and the IR LED of Kinast expose the patient to radiation of two characteristic wavelengths, a red wavelength and an IR wavelength (abstract, lines 2-4). Kinast discloses no means for causing these LEDs to transmit light at different wavelengths, hence different frequencies. Abraham provides no enabling disclosure which would enable one to modify the LEDs of Kinast to operate at different wavelengths.

Kinast calls for driving the two LEDs with identical signals, except shifted by 90° (column 7, lines 12-21). Abraham discloses a device for transmitting communications on power lines and provides no teaching regarding appropriate driver signals for LEDs. Abraham provides no motivation to modify the driver signals for the LEDs of Kinast.

Further, Abraham specifically teaches against spread spectrum modulation due to its numerous drawbacks (column 19, lines 5-12). Accordingly, it is submitted that **claim 17 and claims 25 and 26 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 18 calls for a spread spectrum measurement device which includes logic to direct a spread spectrum signal into a medium. Kinast fails to teach or fairly suggest the use of spread spectrum technology. Abraham specifically teaches against the use of spread spectrum technology at column 19, lines 6-12, for a variety of reasons, such as sensitivity to interference, a problem which one viewing the Kinast

patent would be motivated to avoid. Accordingly, it is submitted that **claim 18** distinguishes patentably and unobviously over the references of record.

Claim 20 calls for a signal transmitter which transmits spread spectrum electrical input signals to a medium interface. Neither Kinast nor Fuller suggest transmitting spread spectrum electrical input signals into a medium interface. Abraham does not cure this shortcoming. First, Abraham relates to transmitting digital data signals on DC power lines and provides no motivation or teachings how one would modify pulse oximeters or spectroscopy devices. Second, Abraham specifically teaches against spread spectrum modulation due to various factors including sensitivity to interference (column 19, lines 6-12). Because Abraham specifically teaches against spread spectrum technology, it provides no motivation to use spread spectrum technology in the devices of Kinast or Fuller. Accordingly, it is submitted that **claim 20 and claim 27 dependent therefrom** distinguish patentably and unobviously over the references of record.

Claim 28 is directed to a spread spectrum physiological condition measurement device. Claim 28 has been carefully crafted to distinguish patentably over the applied references.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-11, 17-18, 20-22, and 24-28 distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, he is requested to telephone Thomas Kocovsky at (216) 861-5582.

Respectfully submitted,

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